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Who We Are

- A volunteer organization - a cross section of backgrounds, professions and interests
- Brought together by mutual concern for the negative impacts resulting from energy restructuring in Ontario – reliability and affordability of power
- Have closely followed the evolving energy policy and significant changes that have taken place in the electricity sector over the past few years
- Ongoing research of energy and environmental information
- Reviewed and responded to Ontario Power Authority (OPA) reports and discussion papers
- Continued participation in conferences and public forums on power supply, OPA workshops
- Submissions and presentations to the public, media, MPPs, MPs, Ministry of Energy, Ministry of the Environment, Legislative Committees, and Trade Unions
- Rely on statistics from informed, unbiased, and credible energy sources – not special interest groups

Overview of Issues

“Ontario’s electricity sector is in the early stages of the biggest infrastructure change in history” (Independent Electricity System Operator). Eighty percent of existing power supply is expected to be replaced or refurbished as a result of aging nuclear facilities, growth in power demand, and environmental concerns. Environmental improvement is the premise given for the removal of Ontario’s coal fired power plants. After much research however, the CAE Alliance contends that Ontario will experience marginal environmental benefits at great cost to our economy.

- Closure of Ontario coal plants will impact affordability of power supply [Pages 4-5](#)
 - Impact of coal fired power to overall provincial air quality is small, however emissions of concern can be significantly and economically controlled [Pages 6-14](#)
 - Natural gas for replacement generation is an expensive, unwise option [Pages 15-18](#)
 - Greenhouse Gas Emissions will not be reduced [Pages 19-20](#)
 - Coal fired generation will be required past 2014 [Pages 21-22](#)
 - Summary of Issues [Page 23](#)
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Coal Closure - Unaffordable

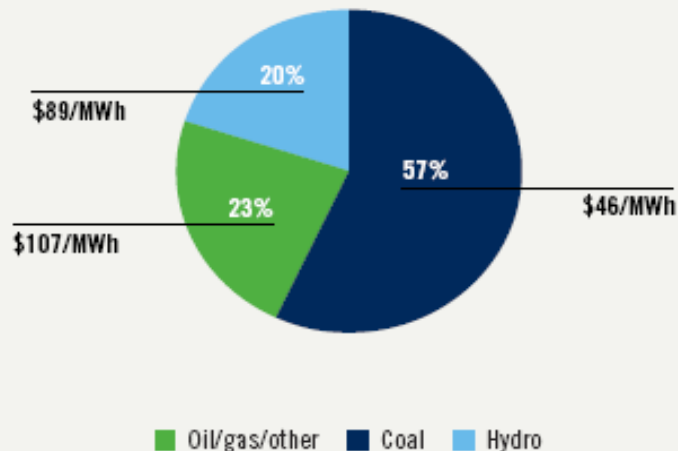
- Electricity Prices will rise 60%-70% by 2014, or 6.5%/year (CIBC World Markets Inc)
- Impact of higher costs will have a “Domino Effect” on industry, business and retail operations – on schools, hospitals and municipalities
- Switching to natural gas will increase Ontario’s use by 37%, impacting cost of home heating, industrial gas use
- “The growing share of electricity produced from natural gas will increasingly tie the price of electricity to that of natural gas.” (National Energy Board)
- Lower priced coal generation (3.8 cents /kw) would not be available to offset the high cost of 8,000 MW of proposed renewable power at 11 – 42 cents /kw
- A leading Natural Resources Canada geologist advises that chemical industries will suffer causing downsizing and plant closures – Sarnia Lambton will be significantly impacted
- Industry is warning that too much reliance on natural gas for electricity will cause irreparable harm to the Ontario economy

“In the end, the Ontario economy must be the most important priority — the economy is the primary driver of all decisions in the Province.” (results of public surveys – report to the Ontario Power Authority, Dec. 2005) 4

Does this Make Sense?

- Premature retirement of publicly owned, paid-for assets – profits are turned back to the Ontario ratepayer, not into the pockets of private power producers
- With retrofits and upgrades, coal plants can run “indefinitely” (Ministry of the Environment)
- Replacement with high priced power – 2 to 10 times that of coal
- Privatization is a motive - replacement with primarily private, for-profit investors
- Expensive natural gas cannot compete while coal remains in the market

SHARE OF WHOLESALE PRICES BY FUEL TYPE (%)
AND PRICE SETTING AVERAGES



◆ Coal currently sets market price more than 55% of the time.

◆ With removal of coal, Natural Gas would set market price 85% of the time (Union Gas)

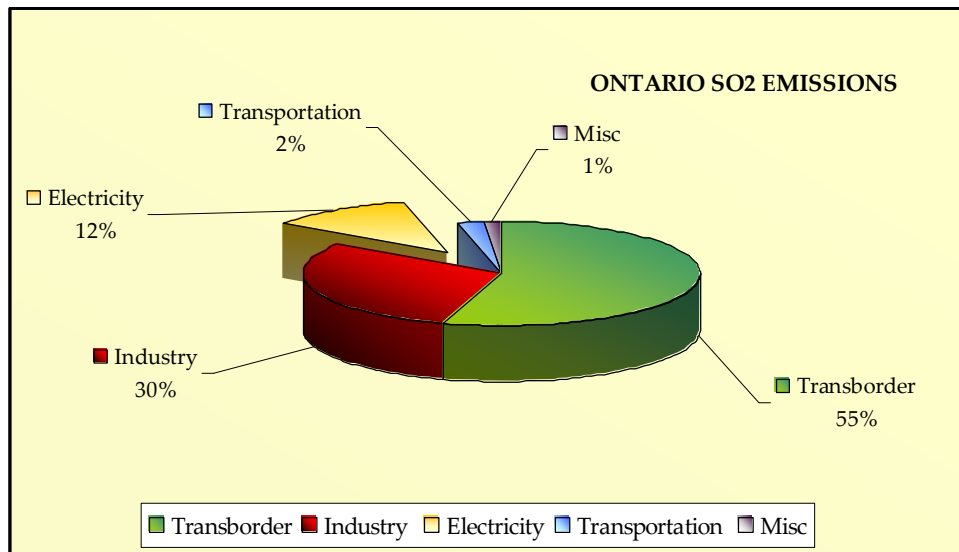
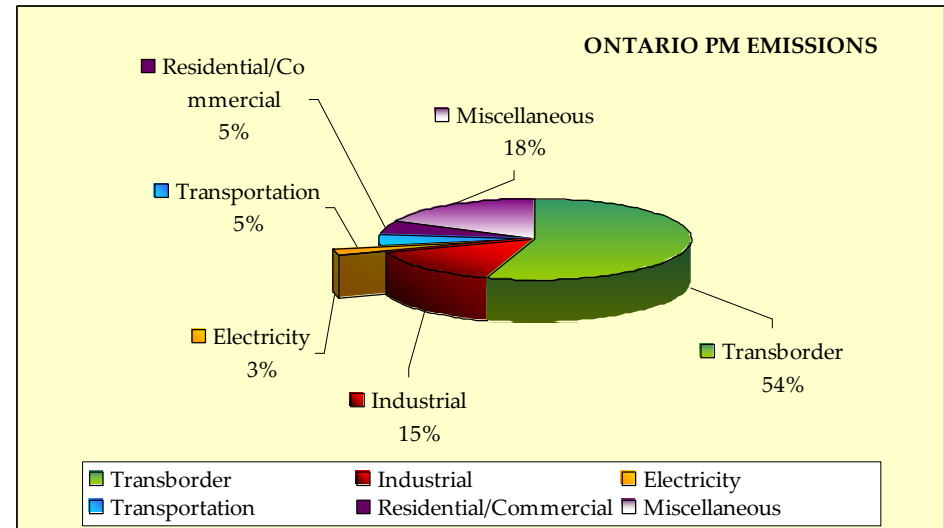
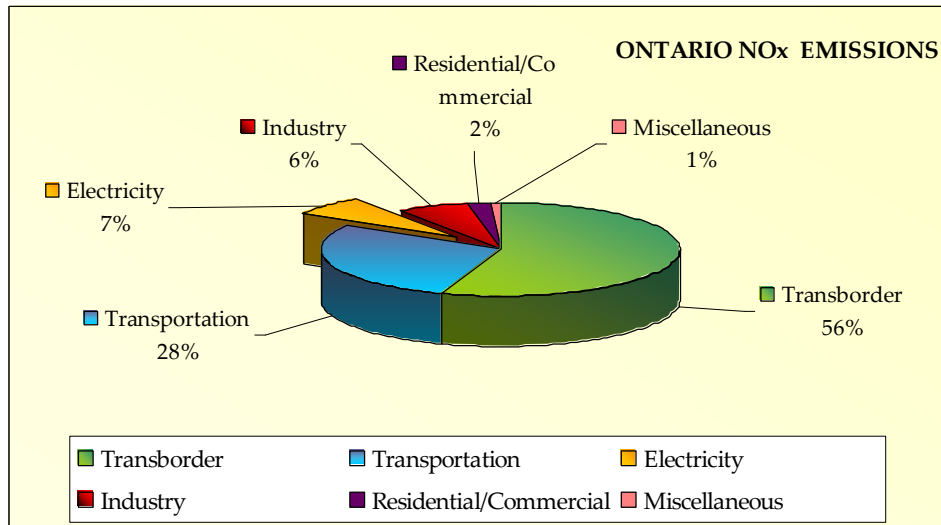
◆ The average cost per unit of energy was over 3 times higher for natural gas than coal, over the 2002-2005 period. (US Energy Information Administration)

(About ½ of daily power demand comes from baseload nuclear and hydro electric facilities –balance of power is purchased through the market, from lowest cost to highest, until required power is acquired – the supply that is sufficient to cover demand determines the price for all participants in the market at that time, i.e. market setting price)

Unnecessary

- Coal contributes less than 5% to Ontario's air quality concerns
- Closing coal plants will make a "small" improvement to Ontario air quality (Government's cost benefit report)
- Retrofitting coal units can reduce emissions, including mercury, 80% - 95% - near par with natural gas fired generation (OPG, OPA, Ministry of the Environment)
- "... if currently existing remediation technology were used, the air quality effects from coal fired power plants are comparable to those from natural gas plants and neither could be distinguished from the regional background at distances more than a few km from the source." (University of Waterloo – Effects on Air Quality of Electric Power Generation by Fossil Fuels, May, 2006)
- Lambton GS units 3 &4, equipped with this technology are rated 4th and 9th cleanest units out of 500 coal plants in North America!
- Ontario's coal fired generation contributes <3% to national greenhouse gas (ghg) emissions; <0.06% to global human ghgs
- Negligible difference between coal and gas when lifecycle greenhouse gas emissions are considered

Emissions from Ontario Coal Plants



The main components of SMOG are O₃, i.e. ground level ozone (NO_x + VOCs) + SO₂, CO, PM (particulate matter) + hot stagnant air.

The total contribution from electricity generation in Ontario for CO is 0.488%; PM 2.5 is 1.438%, PM 10 is 0.833%; VOCs 0.125%.

Transportation is the main source for NO_x, CO and VOCs.

(National Pollutant Release Inventory – Environment Canada)

(Electricity generation includes fossil fuels such as coal, oil and natural gas)

Impact Of Transborder Air Flow On Ontario Air Quality

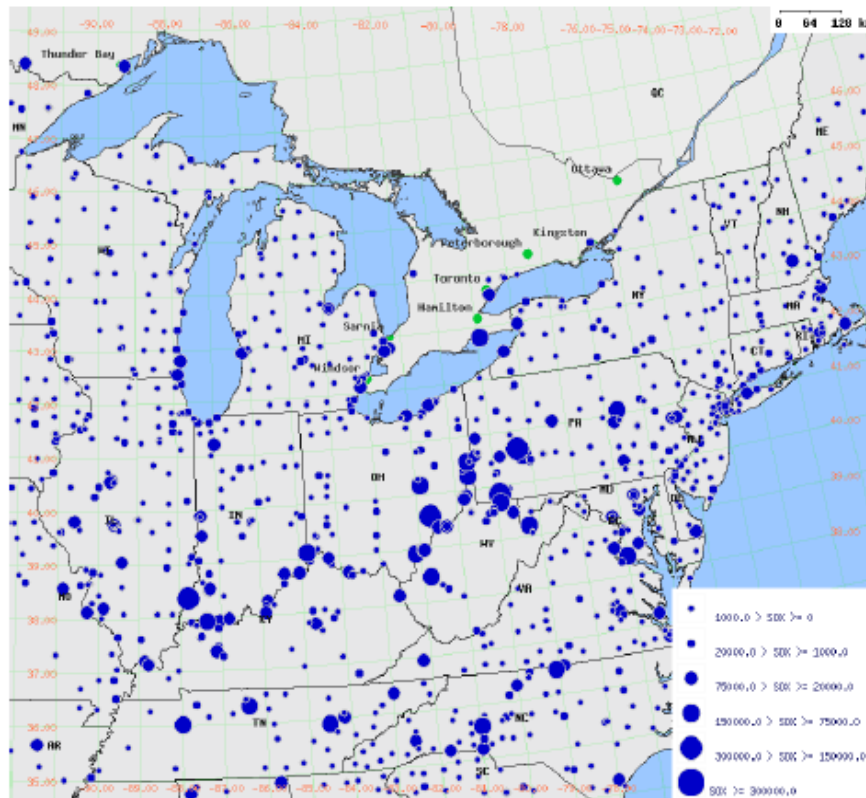
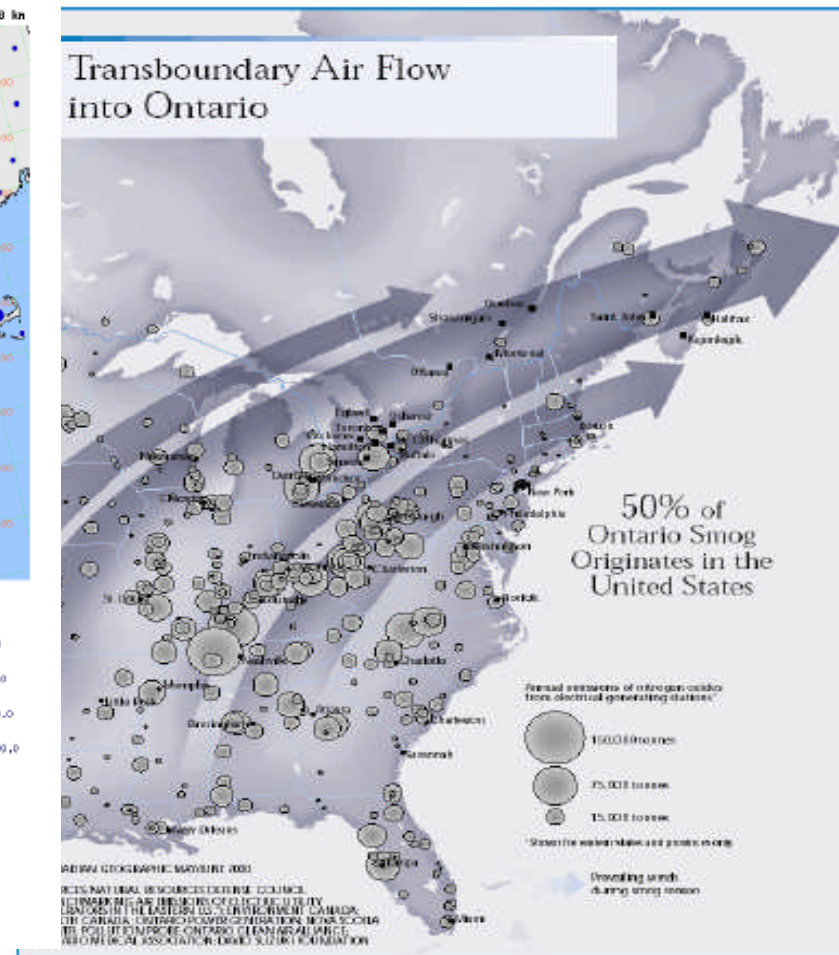


Figure A-4: Sulphur dioxide emissions from power plants shown as dots that vary in size according to their emission inventories U.S. 1995 (with 2001 updates) and Canada 1999 Emission Inventories (source: Ontario Ministry of the Environment)



55% of Ontario's air contaminant emissions originate in the U.S.
(Ontario Ministry of the Environment)

Impact Of Transborder Air Flow On Ontario Air Quality

OZONE

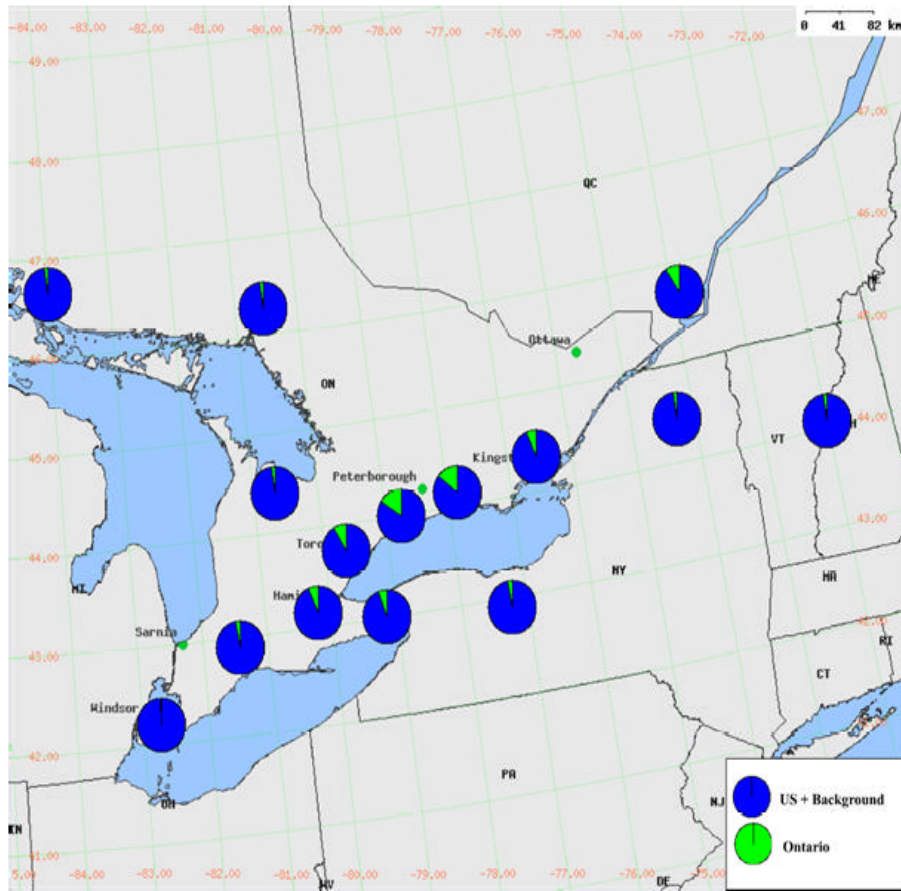


Figure 3.4: Graphic of Transboundary vs. Ontario Contribution for Ozone on High Concentration Days during 1998 Spring/Summer Season.

(source: Ontario Ministry of the Environment)

PM_{2.5}

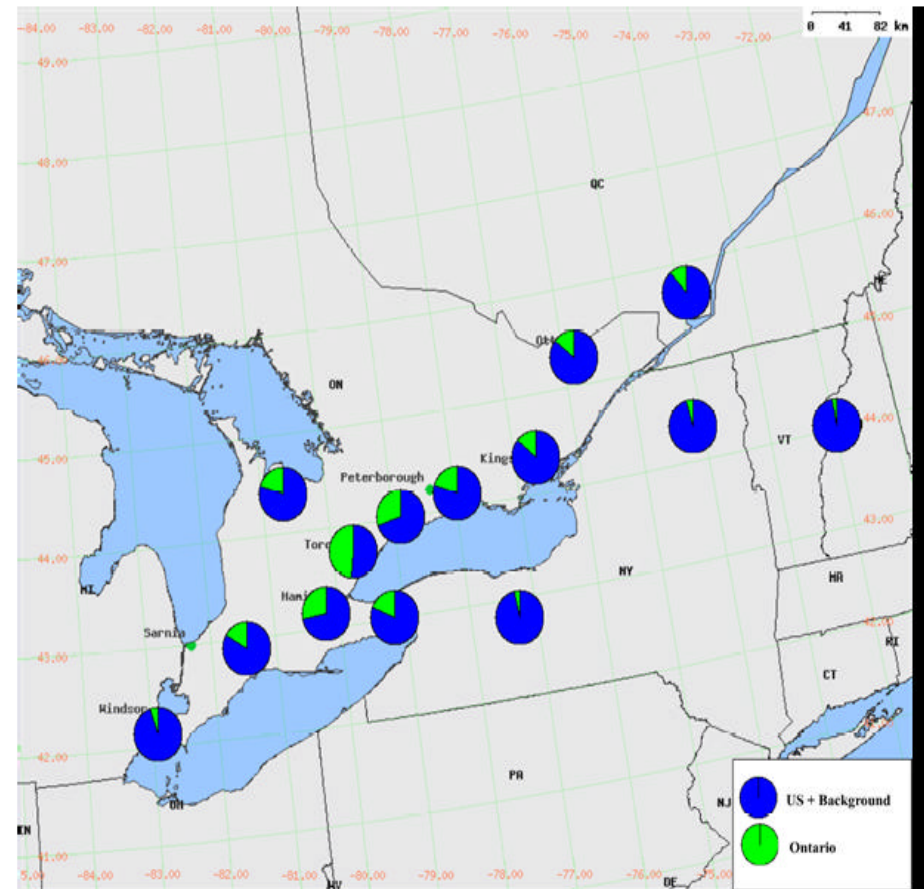


Figure 3.5: Graphic of Transboundary vs. Ontario Contribution for PM_{2.5} on High Concentration Days during 1998 Spring/Summer Season.

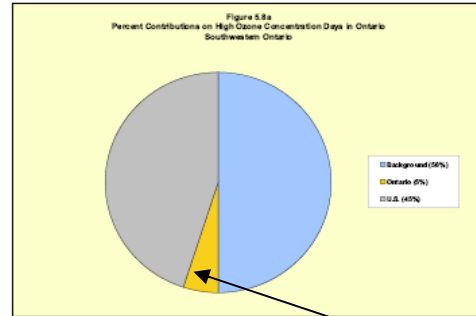
(source: Ontario Ministry of the Environment)

● ONTARIO SOURCES

● US CONTRIBUTION

% Contribution on High Ozone Days In Ontario

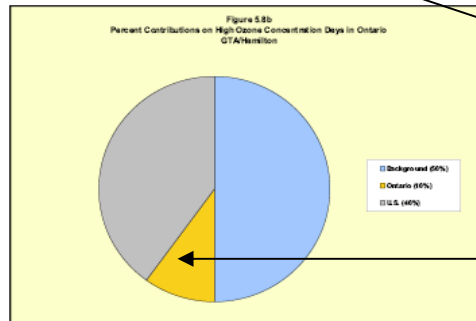
- * Background - 50%
- US Sources - 45%
- All Ontario Sources - 5%



On low ozone days *background concentrations dominate and manmade sources would not contribute as much.

Southwestern Ontario

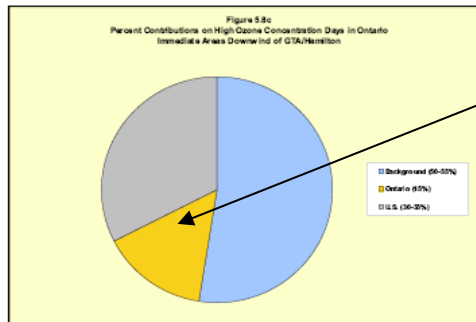
- * Background - 50%
- US Sources - 40%
- All Ontario Sources - 10%



GTA/Hamilton

Coal emissions represent a small portion of this amount

- * Background - 50%
- US Sources - 30-35%
- All Ontario Sources - 15%



Downwind of the GTA/Hamilton

*Background ozone concentrations refer to the contributions at a given location in Ontario that are primarily the result of manmade and natural emissions from outside North America and natural sources within North America.

Net Impact of Coal-Fired Power Plants to Ontario's Air Quality

- Small (less than 5%)
 - The role of Ontario's power plants in forming ground-level ozone in Ontario was studied in a report by RWDI consultants, 2004. The results indicated that had the power plants been removed, there would have been almost no difference. "The reduction in ozone formation across the region would have been imperceptibly small." (Pain Without Gain, Fraser Institute, January, 2005)
 - During smog season coal plants contribute less than 1% to Toronto ozone levels. (0.03 ppb) (Ontario's Cost-Benefit Analysis - Replacing Ontario's Coal-Fired Electricity Generation, prepared for the Ontario Ministry of Energy, April, 2005)
 - "Coal plants in Ontario contribute 3-4% of the total SO₂ and about 1-2% of the NO_x in southern Ontario, 10% and 8% respectively within 20 km of the largest facility." (University of Waterloo Centre for Atmospheric Sciences, May 26, 2006)
 - "Overall, closing down the CFG (coal fired generating) facilities is forecast to improve air quality in most parts of southern Ontario. ... However, these improvements are small compared to the overall ambient concentrations of these pollutants." (Ontario's Cost-Benefit Analysis prepared for the Ministry of Energy April, 2005)
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Ontario Air Quality – Health & Environmental Impacts

- Ontario’s Ministry of the Environment operates an extensive network of air quality monitoring sites across the province
- The Air Quality Index is based on a recording of pollutants that have adverse effects on human health and the environment
- Most recent data - 2005 (hot, smoggy summer) shows that Ontario air quality was rated good or very good an average of 85% of the time; moderate 13%-15% of the time.
- The impact on “moderate” air quality days - “may have some adverse effects for very sensitive people” – odour and potential “respiratory irritation” in sensitive people during vigorous exercise; those with heart/lung disorders potentially at some risk.
- Therefore, 99% of the time most people would not be impacted

Index	Category	Ozone (O ₃)	Fine Particulate Matter (PM _{2.5})	Nitrogen Dioxide (NO ₂)	Carbon Monoxide (CO)	Sulphur Dioxide (SO ₂)	Total Reduced Sulphur (TRS) Compounds
32-49	Moderate	Respiratory irritation in sensitive people during vigorous exercise; people with heart/lung disorders at some risk; damages very sensitive plants	People with respiratory disease at some risk	Odour	Blood chemistry changes, but no noticeable impairment	Damages some vegetation	Odour

Coal’s contribution

1.438%

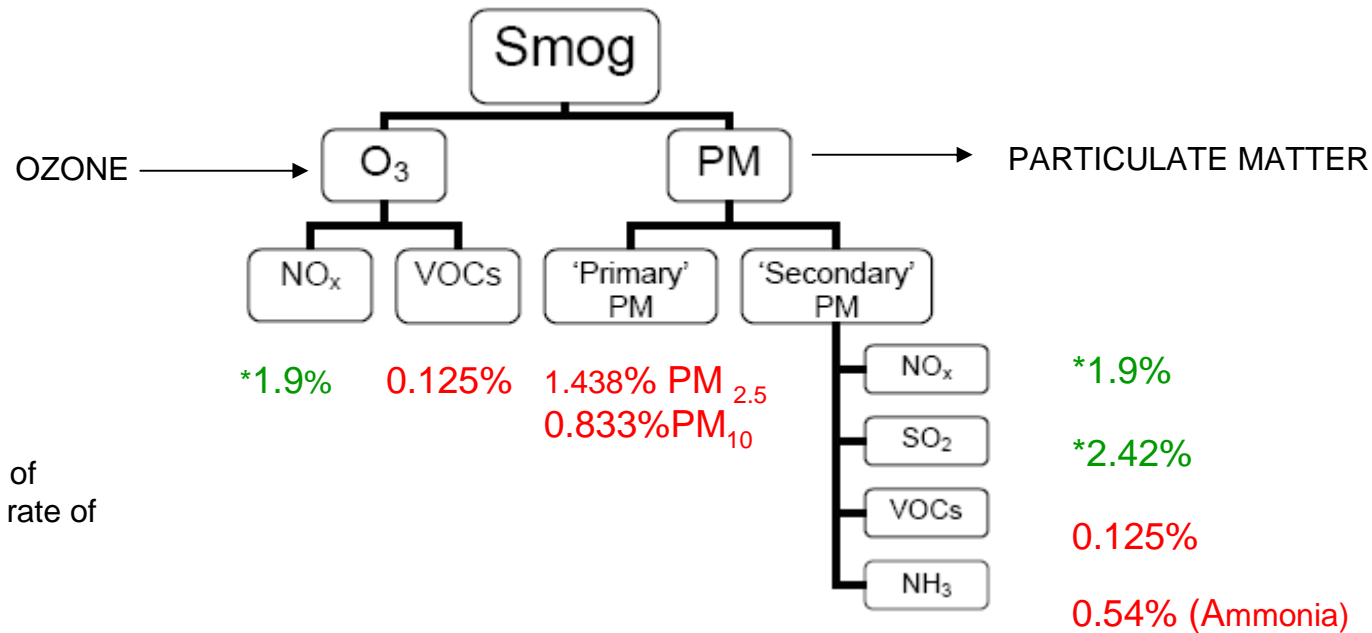
13%

0.49%

24%

Source: Ontario Ministry of the Environment, Air Quality in Ontario, 2005

Contribution of Emissions From Coal-Fired Power Plants – With Pollution Abatement Technology**



* NO_x reduction rate of 85%; SO₂ reduction rate of 90%

(Sources: ONTARIO MINISTRY OF THE ENVIRONMENT – Ontario's Clean Air Action Plan: Protecting Environmental and Human Health in Ontario; Environment Canada – Criteria Air Contaminants Emission Summaries)

Particulate Matter can be reduced 99%; Mercury and other heavy metals can likewise be reduced 60%-90% According to Ontario Power Generation documentation provided to the National Pollutant Release Inventory, pollution reduction technology installed primarily to reduce NO_x and SO₂, has had the co-benefit of capturing 95% of mercury in the flue gas at Lambton Generating Station Units 3 & 4.

** Available, affordable emissions reduction technology – proven effective at Lambton GS – making 2 of those units the 4th and 9th cleanest of about 500 plants in North America

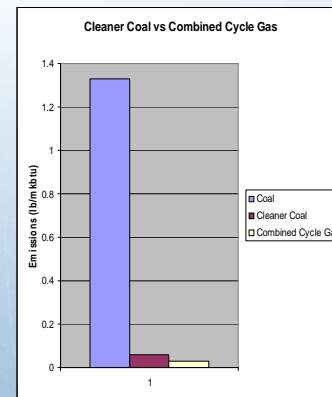
Emissions Reduction Technology

Coal fired Generation can be one of the cleanest power generation alternatives

Smog causing emissions reduction:

- Cleaner Coal - 96.4%
- Replacement with Natural Gas Combined Cycle – 97.3%

Item	Emissions g/MWh	
	Gas	Coal
NOx	26	163
CO	104	49
VOC	16	0
PM2.5	29	8
PM10	0	0
SO ₂	2	82
NH ₃	42	0
Total	224	302



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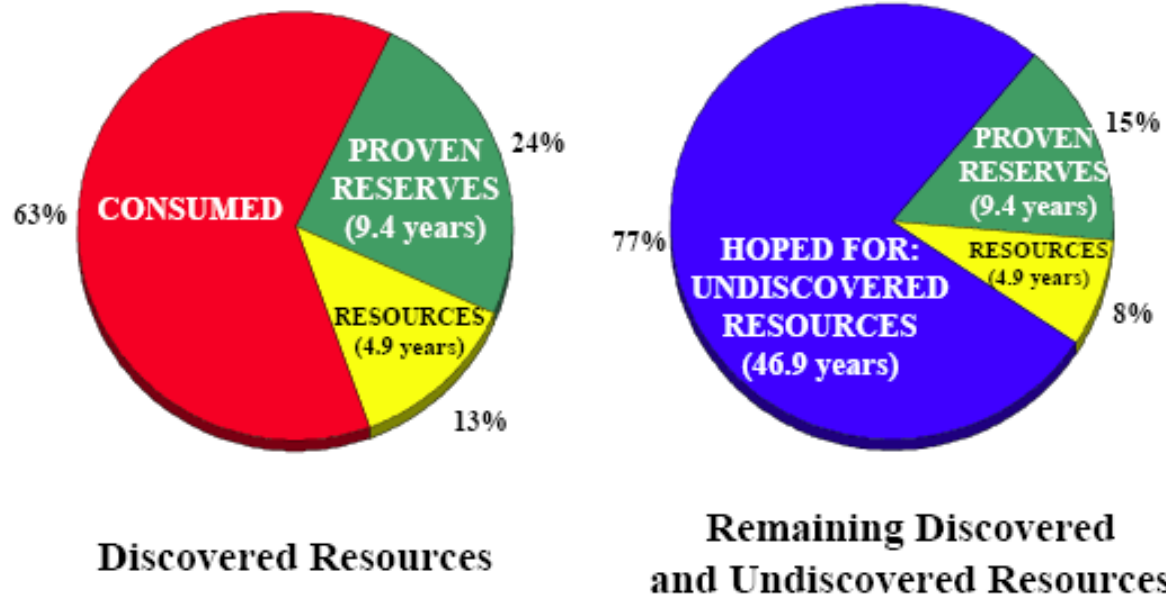
“Many Canadians are unaware that current technology can be applied to existing coal power plants to make them very nearly as clean as modern efficient natural gas turbine combined cycle power plants. Application of these technologies in Ontario would reduce acid rain and smog causing emissions by more than 96%. This would reduce the electric generation contribution to these emissions below the 1% level of all other sources in Ontario. The costly alternative of replacing coal ... with gas... would improve emissions less than 1%.”
Babcock & Wilcox

The Use of Natural Gas for Electricity is Unwise

- The present government has rejected the opportunity to implement proven, available technology on coal fired power plants - Instead, significant natural gas fired generation is being procured
 - The switch to natural gas will have marginal, if any, environmental benefit
 - Increases in ozone concentrations are forecast for Toronto using gas turbines in the GTA. All particulate from natural gas turbines is on the order of 1 micron, and therefore of greater concern. (Ministry of Energy)
 - Natural gas prices are high and volatile and are expected to remain so
 - Prices 10 years from now will be “consistently higher” due to resource depletion and increased demand coupled with higher exploration and development costs. (US Energy Information Administration, Annual Energy Outlook 2006, with projections to 2030)
 - Billions of dollars more to consumers (\$1.5 billion for fuel costs alone had gas been used in place of coal in 2005)
 - Billions for infrastructure changes – (\$60 million alone in Sarnia area to accommodate 2 gas plants – only \$6 million is recoverable from these private power producers – Hydro One)
 - Natural gas is used to heat homes, for agricultural and industrial purposes at 95% efficiency; for electricity generation at 35-50% efficiency
 - Natural gas to replace coal fired generation in Ontario will consume more gas than currently used by all residential consumers combined (Ontario Energy Board)
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Natural Gas Reserves - Canada

Canada's Remaining Discovered and Undiscovered Conventional Marketable Natural Gas Resources According to NEB (2006) Estimates including Lifetime assuming 2005 Production Rates

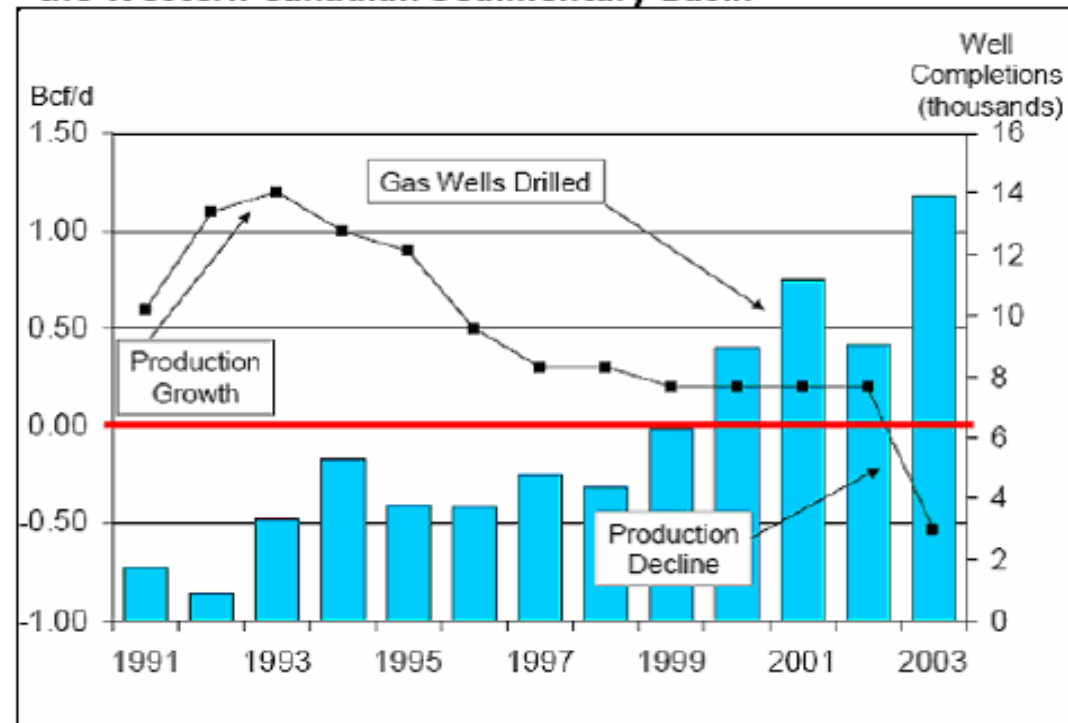


(Resource estimates from National Energy Board, March, 2006, Report 2006-A, as at December 31, 2004; 2004 Proven Reserves from CAPP, 2006; 2005 Production from Statistics Canada, 2006)

Nearly 2/3 of Canada's discovered resources have been consumed leaving only 7.5 years of proven reserves and another 5 years of possible reserves. (National Energy Board) British Petroleum estimates Canada's 2004 reserves to production ratio to be 8.8 years; US reserves to production ratio at 9.8 years.

Declining Natural Gas Supplies – Rising Demand

Figure 3.9.4 – Production Change and Gas Wells Drilled on the Western Canadian Sedimentary Basin

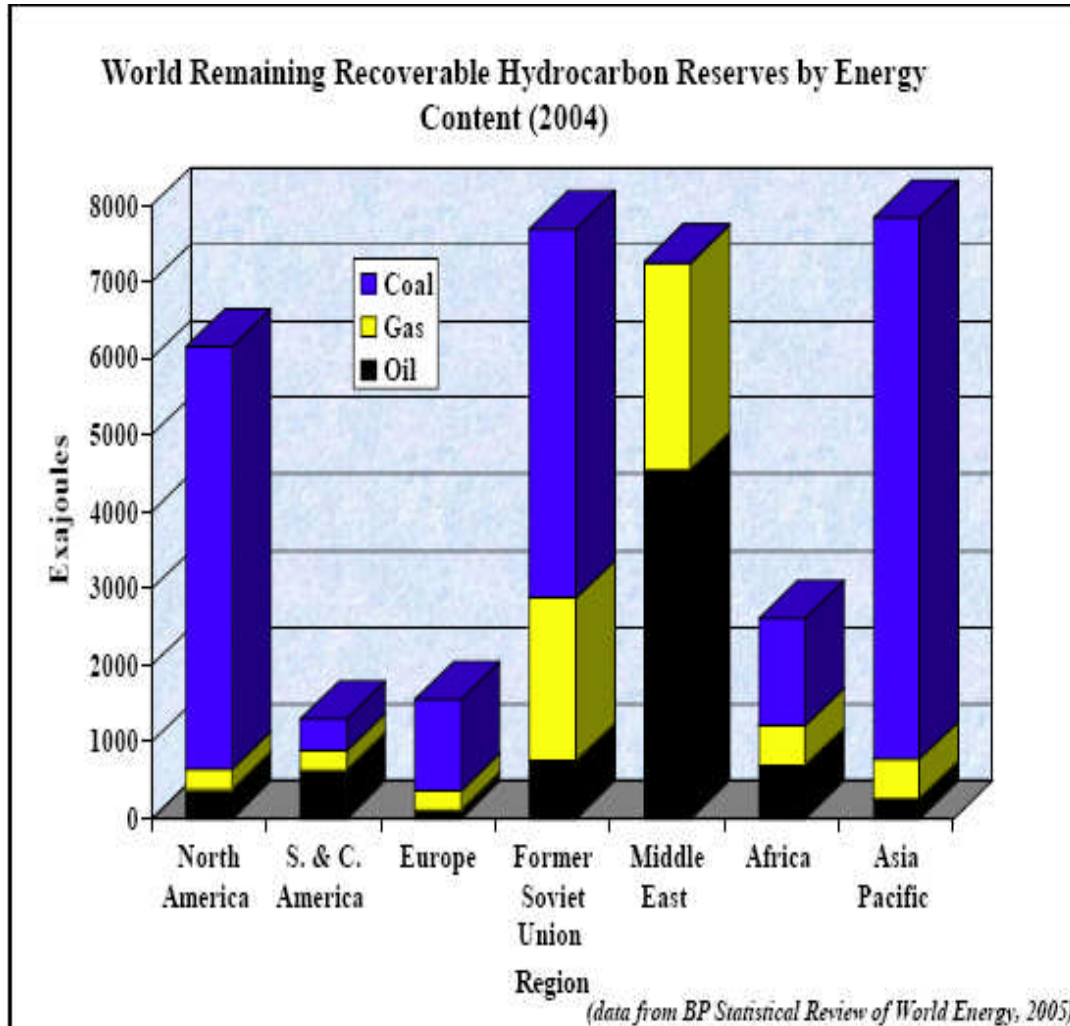


Sources: StatsCan, CAPP, Daily Oil Bulletin, reproduced in NRCan

“More than 95% of the gas consumed in Ontario comes from outside the province, mostly from the WCSB”
“Total Canadian natural gas production declined 4% in 2003” in spite of the fact that “...almost 14,000 wells were drilled in the WCSB, setting a new record ... average of over 38 wells per day.” (Ontario Power Authority)

By 2017, natural gas prices are expected to rise due to depletion of conventional gas resources in the Western basin. (Ontario Power Authority)

World Reserves of Fossil Fuels



◆ “To not continue to use coal is to deny many Canadians access to an inexpensive, secure and readily available fuel, which is free from price volatility and completely capable of being utilized in an environmentally acceptable manner ...” (Natural Resources Canada)

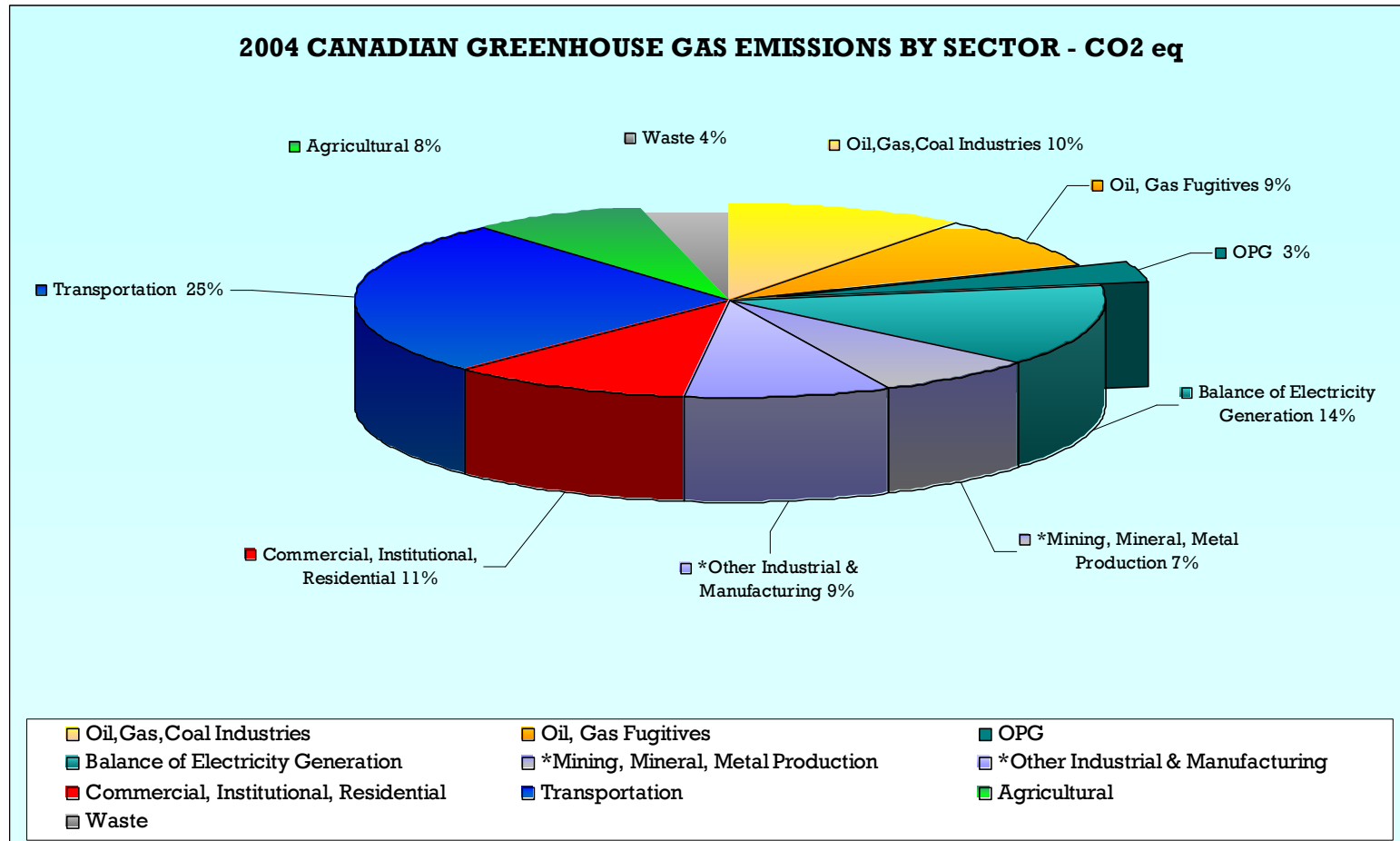
◆ “North America is to coal what Saudi Arabia is to oil.. ... in the context of growing concern about geopolitical tensions and security of energy supply, indigenous sources of supply will become increasingly attractive.” (Ontario Power Authority)

◆ 75% of the world’s remaining reserves of natural gas are in politically unstable regions; the middle east and former Soviet Union

◆ 250+ years of coal reserves in North America

◆ Global reserves of coal dispersed in non-Middle East nations – no cartel or geopolitical impacts

National Greenhouse Gas Emissions by Sector



“Environment Canada, Summary of Canada’s 2004 Greenhouse Gas Inventory”

- ◆ Canadian Contribution to Global Man Made Greenhouse Gases (758 MT) - 2.18%
- ◆ % OPG of Global Man Made Greenhouse Gas Emissions - 0.006%

- ◆ % OPG (coal) of all Canadian GHG emissions approx. 3% (includes Lakeview Generating Station, since removed from service)
 - ◆ % Nanticoke GS of Canadian Emissions 1.9% (14.72 MT)
 - ◆ % Lambton GS of Canadian Emissions 0.95% (7.2 MT)

Greenhouse Gas Emissions

- Ontario's coal plants contribute less than 3% to national greenhouse gas emissions
- Natural gas emits about 55 % the CO₂ of coal generation at point of combustion
- However, there are significant emissions associated with production, flaring, processing and transport of natural gas
- "...A full life-cycle analysis shows that greenhouse gas emissions from natural gas-fired power are anywhere from 35% below to 25% above those from coal power ... Even using the best-case scenario shows that natural gas is a deficient strategy to address climate change." (David Suzuki Foundation)
- "Burning gas instead of coal also sounds good and green since it cuts CO₂ emissions in half. In practice it may be the most dangerous energy source of all, because natural gas is **23 times** as potent a greenhouse gas as CO₂. ... even a 2 percent leak of the natural gas from the production sites to the power stations makes it as bad as burning coal. In practice, the leak rate is 4 percent, so it may be more than twice as bad as burning coal or oil." (Dr. James Lovelock)
- Co-firing coal with biomass - successfully done in Europe and in preliminary stages at Nanticoke – resulting in 30% reduction in CO₂
- Therefore, no benefit from a climate change perspective, in switching from coal to natural gas.

A full assessment of life cycle emissions has not yet been conducted by the government.

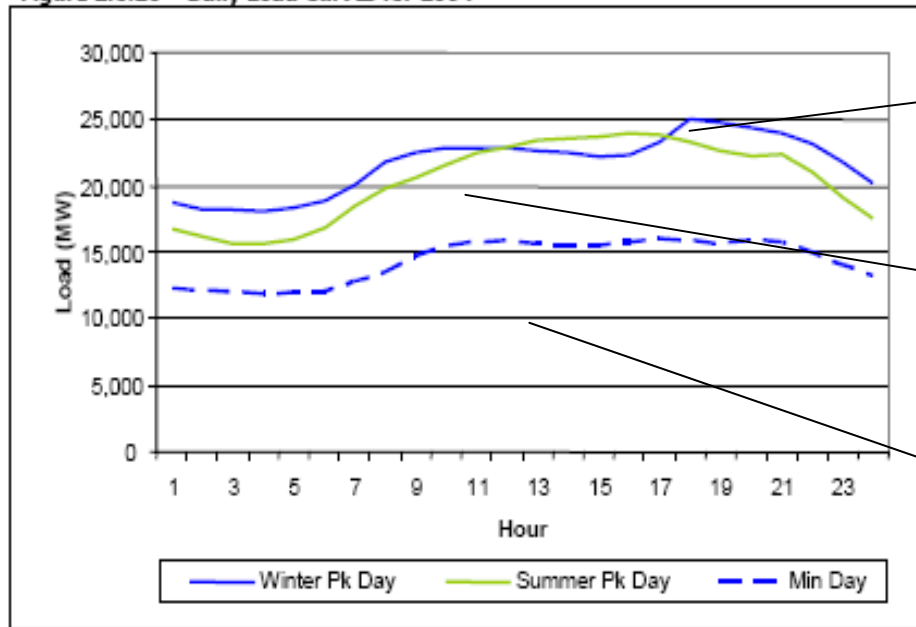
Coal Fired Power Will be Required Past 2014

- Too many contingencies and uncertainties regarding new resources – timing for integration is too constrained to allow for reliable power supply
- Removing 20% of **affordable** power supply (coal) at a critical time
 - existing baseload nuclear units reach end of life 2013-2022 (most critical when a number of units are simultaneously on refurbishment outages)
 - enormous uncertainties regarding potential new resources and transmission requirements
 - projected higher natural gas prices but OPA contracts are making GTA & Golden Horseshoe dependent on gas fired power
 - expiration of many non-utility generating contracts during this time
- Addition of more renewable resources requires optimum load balancing and quick dispatch
- 80% of power supply is to be replaced or refurbished all at higher cost/MWh than current supply resources
- Most ambitious conservation targets every undertaken anywhere (6,300 MW – ¼ of power needs) – We will be undersupplied if these targets cannot be met – underestimation of growth in power demand
- Major transmission investments & reconfigurations needed to bring new generation on line (wind in the Bruce Peninsula area; nuclear from the Bruce, etc.)

Replacement Generation

- ◆ Renewable resources (wind, solar) – costly; intermittent; cannot be relied upon for continual electricity production
- ◆ Ontario has already developed its high capacity hydro resources
- ◆ Nuclear facilities - suitable for base load power; typically run between 85%-100% load.
- ◆ Coal fired generation provides flexible power ; quick response to load fluctuations; optimum load following / load balancing abilities; dispatchable power “24/7”; not impacted by weather or seasons; high probability (90.66%) of availability when needed.

Figure 2.6.20 – Daily Load Curves for 2004



Peak power resources -capable of ramping up quickly to pick up spikes in demand, unexpected outages from other resources, or during particularly hot or cold days.

Intermediate power - As electricity needs increase and decrease during the day (6 am to 9 am; 4 pm – 7 pm), following lifestyle and work patterns of the province, intermediate generation provides additional power as required, then reduces it accordingly.

Base load generation - primarily nuclear and certain run-of-the-river hydroelectric - represents 50% of Ontario’s power production - generate continuously, - do not cycle on and off, but operate to meet the minimum daily demand at constant rates of production.

Source: IESO Market Data

Typical daily load patterns

Conclusion:

The CAE Alliance continues to voice our concerns for Ontario's future. We believe that crucial energy decisions continue to be made without consideration of all available information. The government's mandate is to ensure "that Ontarians have access to safe, reliable and environmentally sustainable energy supplies at competitive prices", and to "protect the interests of consumers with respect to prices and the adequacy, reliability and quality of electricity service". (Statement of Environmental Values; Electricity Restructuring Act) We believe that maintaining the coal fired power plants, with the installation of the best available emissions reduction technology on all units, is the key to retaining affordable and reliable electricity without compromise to the environment.